ISSN (print) 0093-4666 © 2012. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/120.443

Volume 120, pp. 443–450 *April–June 2012*

New combinations in *Lactifluus*. 3. *L.* subgenera *Lactifluus* and *Piperati*

A. Verbeken[1], K. Van de Putte[1] & E. De Crop[1]

[1]*Ghent University, Department of Biology, Research Group Mycology, K.L. Ledeganckstraat 35, B-9000 Gent, Belgium*

Correspondence to: *mieke.verbeken@ugent.be*

Abstract — In this last of a series of three papers, new combinations in the genus *Lactifluus* are proposed. This paper treats *Lactifluus* subg. *Lactifluus* (an autonymous subgenus) and *Lactifluus* subg. *Piperati* (proposed as a new subgenus). In *Lactifluus* subg. *Lactifluus*, six sections are recognized (five of them as new combinations) and 46 new combinations are proposed at species level. In *Lactifluus* subg. *Piperati*, two sections are recognized (as new combinations) and nine new species combinations are proposed. In addition, new combinations are proposed for an unassigned section and its single species as well as for three unassigned species.

Key words — milkcaps, nomenclature, *Lactarius*, *Russulaceae*

Introduction

This is the third treatment of species formerly treated in *Lactarius* Pers. and now classified in *Lactifluus* (Pers.) Roussel. *Lactifluus* subgenera *Edules*, *Lactariopsis*, and *Russulopsis* were discussed in the first article (Verbeken et al. 2012) and *Lactifluus* subg. *Gerardii* in the second (Stubbe et al. 2012).

Taxonomy

Lactifluus subg. *Lactifluus*

This large and diverse subgenus comprises 6 sections. *Lactifluus* sect. *Rubroviolascentini*, with 2 species, is endemic to tropical Africa. Two sections, *L.* sect. *Polysphaerophori* and *L.* sect. *Pseudogymnocarpi* (each with 8 species) are almost completely African, except for one South American species in *L.* sect. *Polysphaerophori* and one Chinese species in *L.* sect. *Pseudogymnocarpi*. *L.* sect. *Phlebonemi* (11 species) and *L.* sect. *Tomentosi* (9 species) also have their major distribution in Africa, but contain some species from North and Central America, Australia, Europe and Asia. *Lactifluus* sect. *Lactifluus* with

Asian, American, and European species is the only section not represented in tropical Africa.

Five species in *Lactifluus* subg. *Lactifluus* have already been recombined: *L. corrugis*, *L. oedematopus*, *L. princeps* and *L. volemus* in *L.* sect. *Lactifluus*; and *L. hygrophoroides* in *L.* sect. *Tomentosi*.

Lactifluus (Pers.) Roussel, Fl. Calvados, Ed. 2: 66. 1806, **subg. *Lactifluus***

Type: *Agaricus lactifluus* L. [= *L. volemus* (Fr. : Fr.) Kuntze] (see Buyck et al. 2010).

= *Lactarius* subg. *Lactifluus* (Burl.) Hesler & A.H. Sm., N. Am. Species *Lactarius*: 158. 1979.

Type: *Agaricus volemus* Fr. : Fr.

Lactifluus (Pers.) Roussel, Fl. Calvados, Ed. 2: 66. 1806, **sect. *Lactifluus***

Type: *Agaricus lactifluus* L.

= *Lactarius* subsect. *Lactifluini* (Burl.) Singer, Ann. Mycol. 40: 114. 1942.

≡ *Lactarius* subsect. *Volemi* Pacioni & Lalli, Mycotaxon 44: 190. 1992, nom. superfl.

Type: *Agaricus volemus* Fr. : Fr.

Lactifluus acicularis (Van de Putte & Verbeken) Van de Putte, **comb. nov.**

Mycobank MB 564580

≡ *Lactarius acicularis* Van de Putte & Verbeken, Fungal Diversity 45: 108. 2010.

Lactifluus austrovolemus (Hongo) Verbeken, **comb. nov.**

Mycobank MB 564581

≡ *Lactarius austrovolemus* Hongo, Rep. Tottori Mycol. Inst. 10: 362. 1973.

Lactifluus corrugis (Peck) Kuntze, Revis. Gen. Pl. 2: 856. 1891.

≡ *Lactarius corrugis* Peck, Annual Rep. New York State Mus. 32: 31. 1880 ("1878").

Lactifluus crocatus (Van de Putte & Verbeken) Van de Putte, **comb. nov.**

Mycobank MB 564582

≡ *Lactarius crocatus* Van de Putte & Verbeken, Fungal Diversity 45: 112. 2010..

Lactifluus distantifolius (Van de Putte, Stubbe & Verbeken) Van de Putte, **comb. nov.**

Mycobank MB 564583

≡ *Lactarius distantifolius* Van de Putte, Stubbe & Verbeken, Fungal Diversity 45: 115. 2010.

Lactifluus lamprocystidiatus (Verbeken & E. Horak) Verbeken, **comb. nov.**

Mycobank MB 564584

≡ *Lactarius lamprocystidiatus* Verbeken & E. Horak, Austr. Syst. Bot. 13: 674. 2000.

Lactifluus longipilus (Van de Putte, H.T. Le & Verbeken) Van de Putte, **comb. nov.**

Mycobank MB 564585

≡ *Lactarius longipilus* Van de Putte, H.T. Le & Verbeken, Fungal Diversity 45: 117. 2010.

Lactifluus oedematopus (Scop.) Kuntze, Revis. Gen. Pl. 2: 857. 1891.

≡ *Agaricus oedematopus* Scop., Fl. Carniol., Ed. 2, 2: 453. 1772.

Lactifluus pallidilamellatus (Montoya & Bandala) Van de Putte, **comb. nov.**

Mycobank MB 564586

≡ *Lactarius pallidilamellatus* Montoya & Bandala, Cryptog. Mycol. 25: 16. 2004.

Lactifluus pinguis (Van de Putte & Verbeken) Van de Putte, **comb. nov.**
Mycobank MB 564587
≡ *Lactarius pinguis* Van de Putte & Verbeken, Fungal Diversity 45: 119. 2010.

Lactifluus princeps (Berk.) Kuntze, Revis. Gen. Pl. 2: 857. 1891.
≡ *Lactarius princeps* Berk., Hooker's J. Bot. Kew Gard. Misc. 4: 135. 1852.

Lactifluus vitellinus (Van de Putte & Verbeken) Van de Putte, **comb. nov.**
Mycobank MB 564588
≡ *Lactarius vitellinus* Van de Putte & Verbeken, Fungal Diversity 45: 121. 2010.

Lactifluus volemus (Fr.: Fr.) Kuntze, Revis. Gen. Pl. 2: 857. 1891.
≡ *Agaricus volemus* Fr.: Fr., Syst. Mycol. 1: 69. 1821.

Lactifluus* sect. *Polysphaerophori (Singer) Verbeken, **comb. nov.**
Mycobank MB 564589
≡ *Lactarius* sect. *Polysphaerophori* Singer, Beih. Sydowia 7: 106. 1973.
Type: *Lactarius veraecrucis* Singer.
= *Lactarius* sect. *Gymnocarpi* R. Heim ex Verbeken, Mycotaxon 66: 374. 1998.
Type: *Lactarius gymnocarpus* R. Heim ex Singer

Lactifluus albocinctus (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564590
≡ *Lactarius albocinctus* Verbeken, Syst. Geogr. Pl. 70: 182. 2000.

Lactifluus brunnescens (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564591
≡ *Lactarius brunnescens* Verbeken, Bull. Jard. Bot. Belg. 65: 199. 1996.

Lactifluus flammans (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564592
≡ *Lactarius flammans* Verbeken, Mycotaxon 55: 539. 1995.

Lactifluus foetens (Verbeken & Van Rooij) Verbeken, **comb. nov.**
Mycobank MB 564593
≡ *Lactarius foetens* Verbeken & Van Rooij, Nova Hedwigia 77: 230. 2003.

Lactifluus goossensiae (Beeli) Verbeken, **comb. nov.**
Mycobank MB 564594
≡ *Lactarius goossensiae* Beeli, Bull. Soc. Roy. Bot. Belgique 60: 165. 1928.

Lactifluus gymnocarpus (R. Heim ex Singer) Verbeken, **comb. nov.**
Mycobank MB 564595
≡ *Lactarius gymnocarpus* R. Heim ex Singer, Pap. Michigan Acad. Sci. 32: 107. 1946.

Lactifluus tanzanicus (Karhula & Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564596
≡ *Lactarius tanzanicus* Karhula & Verbeken, Karstenia 38: 50. 1998.

Lactifluus veraecrucis (Singer) Verbeken, **comb. nov.**
Mycobank MB 564597
≡ *Lactarius veraecrucis* Singer, Beih. Sydowia 7: 104. 1973.

Lactifluus* sect. *Phlebonemi (R. Heim ex Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564598
≡ *Lactarius* sect. *Phlebonemi* R. Heim ex Verbeken, Mycotaxon 66: 378. 1998.
Type: *Lactarius phlebonemus* R. Heim & Gooss.-Font.
= *Lactarius* subsect. *Luteoli* Pacioni & Lalli, Mycotaxon 44: 190. 1992.
≡ *Lactarius* sect. *Luteoli* (Pacioni & Lalli) Pierotti, Boll. Gruppo Micol. Bres. 48: 54. 2007.
Type: *Lactarius luteolus* Peck

Lactifluus angustus (R. Heim & Gooss.-Font.) Verbeken, **comb. nov.**
MycoBank MB 564599
≡ *Lactarius angustus* R. Heim & Gooss.-Font., Bull. Jard. Bot. État 25: 67. 1955.

Lactifluus arsenei (R. Heim) Verbeken, **comb. nov.**
MycoBank MB 564600
≡ *Lactarius arsenei* R. Heim, Candollea 7: 380. 1938, as "*arsenii*".

Lactifluus brunneoviolascens (Bon) Verbeken, **comb. nov.**
MycoBank MB 564601
≡ *Lactarius brunneoviolascens* Bon, Doc. Mycol. 1 (2): 45. 1971.

Lactifluus caribaeus (Pegler) Verbeken, **comb. nov.**
MycoBank MB 564602
≡ *Lactarius caribaeus* Pegler, Kew Bull. 33: 617. 1979.

Lactifluus longivelutinus (X.H. Wang & Verbeken) X.H. Wang, **comb. nov.**
MycoBank MB 564603
≡ *Lactarius longivelutinus* X.H. Wang & Verbeken, Nova Hedwigia 83 (1-2): 168, 2006.

Lactifluus luteolus (Peck) Verbeken, **comb. nov.**
MycoBank MB 564604
≡ *Lactarius luteolus* Peck, Bull. Torrey Bot. Club 23: 412. 1896.

Lactifluus nonpiscis (Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564605
≡ *Lactarius nonpiscis* Verbeken, Bull. Jard. Bot. Belg. 65: 204. 1996.

Lactifluus phlebonemus (R. Heim & Gooss.-Font.) Verbeken, **comb. nov.**
MycoBank MB 564606
≡ *Lactarius phlebonemus* R. Heim & Gooss.-Font., Bull. Jard. Bot. État 25: 38. 1955.

Lactifluus pisciodorus (R. Heim) Verbeken, **comb. nov.**
MycoBank MB 564607
≡ *Lactarius pisciodorus* R. Heim, Candollea 7: 380. 1938.

Lactifluus putidus (Pegler) Verbeken, **comb. nov.**
MycoBank MB 564608
≡ *Lactarius putidus* Pegler, Kew Bull. 33: 620. 1979.

Lactifluus rubrobrunnescens (Verbeken, E. Horak & Desjardin) Verbeken, **comb. nov.**
MycoBank MB 564609
≡ *Lactarius rubrobrunnescens* Verbeken, E. Horak & Desjardin, Sydowia 53: 274. 2001.

Lactifluus* sect. *Pseudogymnocarpi (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564610
≡ *Lactarius* sect. *Pseudogymnocarpi* Verbeken, Mycotaxon 66: 376. 1998.
Type: *Lactarius gymnocarpoides* Verbeken

Lactifluus carmineus (Verbeken & Walleyn) Verbeken, **comb. nov.**
Mycobank MB 564611
≡ *Lactarius carmineus* Verbeken & Walleyn, Syst. Geogr. Pl. 70: 190. 2000.

Lactifluus gymnocarpoides (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564612
≡ *Lactarius gymnocarpoides* Verbeken, Mycotaxon 55: 530. 1995.

Lactifluus longisporus (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564613
≡ *Lactarius longisporus* Verbeken, Mycotaxon 55: 527. 1995.

Lactifluus luteopus (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564614
≡ *Lactarius luteopus* Verbeken, Mycotaxon 55: 536. 1995.

Lactifluus medusae (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564615
≡ *Lactarius medusae* Verbeken, Mycotaxon 55: 532. 1995.

Lactifluus pseudogymnocarpus (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564616
≡ *Lactarius pseudogymnocarpus* Verbeken, Mycotaxon 55: 523. 1995.

Lactifluus pumilus (Verbeken) Verbeken, **comb. nov.**
Mycobank MB 564617
≡ *Lactarius pumilus* Verbeken, Bull. Jard. Bot. Belg. 65: 205. 1996.

Lactifluus tenuicystidiatus (X.H. Wang & Verbeken) X.H. Wang, **comb. nov.**
Mycobank MB 564618
≡ *Lactarius tenuicystidiatus* X.H. Wang & Verbeken, Nova Hedwigia 83: 173, 2006.

Lactifluus* sect. *Rubroviolascentini (Singer) Verbeken, **comb. nov.**
Mycobank MB 564619
≡ *Lactarius* subsect. *Rubroviolascentini* Singer, Ann. Mycol. 40: 114. 1942.
≡ *Lactarius* sect. *Rubroviolascentini* (Singer) Verbeken, Mycotaxon 66: 380. 1998, as "*Rubroviolascentes*".
Type: *Lactarius rubroviolascens* R. Heim

Lactifluus denigricans (Verbeken & Karhula) Verbeken, **comb. nov.**
Mycobank MB 564620
≡ *Lactarius denigricans* Verbeken & Karhula, Persoonia 16: 219. 1996.

Lactifluus rubroviolascens (R. Heim) Verbeken, **comb. nov.**
Mycobank MB 564621
≡ *Lactarius rubroviolascens* R. Heim, Candollea 7: 377. 1938.

Lactifluus* sect. *Tomentosi (McNabb) Verbeken, **comb. nov.**
MycoBank MB 564622
≡ *Lactarius* sect. *Tomentosi* McNabb, New Zealand J. Bot. 9: 59. 1971.
≡ *Lactarius* subsect. *Clarkeina* McNabb, New Zealand J. Bot. 9: 59. 1971.
Type: *Lactarius clarkeae* Cleland
= *Lactarius* subsect. *Rugati* Pacioni & Lalli, Mycotaxon 44: 190. 1992, nom. superfl.
≡ *Lactarius* sect. *Rugati* Verbeken, Mycotaxon 66: 372. 998, 1998, nom. superfl.
Type: *Lactarius rugatus* Kühner & Romagn.

Lactifluus clarkeae (Cleland) Verbeken, **comb. nov.**
MycoBank MB 564623
≡ *Lactarius clarkeae* Cleland, Trans. & Proc. Roy. Soc. S. Australia 51: 302. 1927, as "*clarkei*".

Lactifluus hygrophoroides (Berk. & M.A. Curtis) Kuntze, Revis. Gen. Pl. 2: 857. 1891.
≡ *Lactarius hygrophoroides* Berk. & M.A. Curtis, Ann. Mag. Nat. Hist., Ser. 3, 4: 293. 1859.

Lactifluus kivuensis (Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564624
≡ *Lactarius kivuensis* Verbeken, Bull. Jard. Bot. Belg. 65: 202. 1996.

Lactifluus pseudoluteopus (X.H. Wang & Verbeken) X.H. Wang, **comb. nov.**
MycoBank MB 564625
≡ *Lactarius pseudoluteopus* X.H. Wang & Verbeken, Nova Hedwigia 83: 171. 2006.

Lactifluus pseudovolemus (R. Heim) Verbeken, **comb. nov.**
MycoBank MB 564626
≡ *Lactarius pseudovolemus* R. Heim, Candollea 7: 378. 1938.

Lactifluus rubiginosus (Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564627
≡ *Lactarius rubiginosus* Verbeken, Bull. Jard. Bot. Belg. 65: 207. 1996.

Lactifluus rugatus (Kühner & Romagn.) Verbeken, **comb. nov.**
MycoBank MB 564628
≡ *Lactarius rugatus* Kühner & Romagn., Bull. Soc. Mycol. France 69: 362. 1954 ("1953").

Lactifluus xerampelinus (Karhula & Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564629
≡ *Lactarius xerampelinus* Karhula & Verbeken, Karstenia 38: 59. 1998.

Lactifluus volemoides (Karhula) Verbeken, **comb. nov.**
MycoBank MB 564630
≡ *Lactarius volemoides* Karhula, Karstenia 38: 53. 1998.

Lactifluus subg. *Piperati*

This group consists of two sections, one with 9 species described from Europe and Asia (but also with records from North America), and the other with one American species. The combination *Lactifluus piperatus* has already been proposed.

Lactifluus* subg. *Piperati Verbeken, **subg. nov.**

Mycobank MB 564631

Pileus pallidus, saepe albus vel albidus, siccus. Pileipellis hyphoepithelium, tenue stratum hyphis hyalinis super cellullis globosis. Dermatocystidia interdum presentia.

Type: *Agaricus piperatus* L.: Fr.

Lactifluus* sect. *Piperati (Fr.) Verbeken, **comb. nov.**

Mycobank MB 564632

≡ *Agaricus* sect. *Piperati* Fr., Syst. Mycol. 1: 73. 1821.

≡ *Lactarius* sect. *Piperati* (Fr.: Fr.) Fr., Epicr. Syst. Mycol.: 338. 1838.

Type: *Agaricus piperatus* L.: Fr.

Lactifluus dwaliensis (K. Das, J.R. Sharma & Verbeken) K. Das, **comb. nov.**

Mycobank MB 564633

≡ *Lactarius dwaliensis* K. Das, J.R. Sharma & Verbeken, Mycotaxon 88: 334. 2003.

Lactifluus glaucescens (Crossl.) Verbeken, **comb. nov.**

Mycobank MB 564634

≡ *Lactarius glaucescens* Crossl., Naturalist, J. Nat. Hist. N. England 1900(516): 5. 1900.

≡ *Lactarius piperatus* var. *glaucescens* (Crossl.) Hesler & A.H. Sm., N. Amer. Species *Lactarius*: 186. 1979

Lactifluus leucophaeus (Verbeken & E. Horak) Verbeken, **comb. nov.**

Mycobank MB 564635

≡ *Lactarius leucophaeus* Verbeken & E. Horak, Austr. Syst. Bot. 12: 768. 1999.

Lactifluus novoguineensis (Henn.) Verbeken, **comb. nov.**

Mycobank MB 564636

≡ *Lactarius novoguineensis* Henn., Bot. Jahrb. Syst. 25: 503. 1898.

Lactifluus olivescens (Verbeken & E. Horak) Verbeken, **comb. nov.**

Mycobank MB 564637

≡ *Lactarius olivescens* Verbeken & E. Horak, Austr. Syst. Bot. 13: 678. 2000.

Lactifluus paleus (Verbeken & E. Horak) Verbeken, **comb. nov.**

Mycobank MB 564638

≡ *Lactarius paleus* Verbeken & E. Horak, Austr. Syst. Bot. 12: 771. 1999.

Lactifluus piperatus (L. : Fr.) Kuntze, Revis. Gen. Pl. 2: 857. 1891.

≡ *Agaricus piperatus* L.: Fr., Sp. Pl.: 1173. 1753.

≡ *Lactarius piperatus* (L. : Fr.) Pers., Tent. Disp. Meth. Fung.: 64. 1797.

≡ *Galorrheus piperatus* (L.: Fr.) Fr., Stirp. Agri Femsion. 3: 57. 1825.

Lactifluus roseophyllus (R. Heim) De Crop, **comb. nov.**

Mycobank MB 564639

≡ *Lactarius roseophyllus* R. Heim, Rev. Mycol. (Paris) 30: 237. 1966 ("1965").

Lactifluus subpiperatus (Hongo) Verbeken, **comb. nov.**

Mycobank MB 564647

≡ *Lactarius subpiperatus* Hongo, Mem. Fac. Liberal Arts Shiga Univ., Nat. Sci. 15: 46. 1964.

Lactifluus* sect. *Allardii (Hesler & A.H. Sm.) De Crop, **comb. nov.**
MycoBank MB 564640
≡ *Lactarius* sect. *Allardii* Hesler & A.H. Sm., N. Amer. Species *Lactarius*: 207. 1979.
Type: *Lactarius allardii* Coker

Lactifluus allardii (Coker) De Crop, **comb. nov.**
MycoBank MB 564641
≡ *Lactarius allardii* Coker, J. Elisha Mitchell Sci. Soc. 34: 12. 1918.

Unassigned taxa

The following section has not yet been assigned to a subgenus. Only one species, described from tropical Africa, is known.

Lactifluus* sect. *Aurantiifolii (Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564642
≡ *Lactarius* sect. *Aurantiifolii* Verbeken, Mycotaxon 77: 441. 2001.
Type: *Lactarius aurantiifolius* Verbeken

Lactifluus aurantiifolius (Verbeken) Verbeken, **comb. nov.**
MycoBank MB 564643
≡ *Lactarius aurantiifolius* Verbeken, Bull. Jard. Bot. Belg. 65: 197. 1996.

The following species have an uncertain systematic position, but morphological and/or molecular data support their placement in *Lactifluus*.

Lactifluus caperatus (R. Heim & Gooss.-Font.) Verbeken, **comb. nov.**
MycoBank MB 564644
≡ *Lactarius caperatus* R. Heim & Gooss.-Font., Bull. Jard. Bot. État 25: 36. 1955.

Lactifluus cocosmus (Van de Putte & De Kesel) Van de Putte, **comb. nov.**
MycoBank MB 564645
≡ *Lactarius cocosmus* Van de Putte & De Kesel, Cryptog. Mycol. 30: 40. 2009.

Lactifluus subclarkeae (Grgur.) Verbeken, **comb. nov.**
MycoBank MB 564646
≡ *Lactarius subclarkeae* Grgur., Larger Fungi S. Australia: 63, 1997.

Acknowledgments

The authors acknowledge Scott Redhead and Shaun Pennycook for valuable comments and for reviewing the manuscript.

Literature cited

Buyck B, Hofstetter V, Verbeken A, Walleyn R. 2010. Proposal to conserve *Lactarius* nom. cons. (*Basidiomycota*) with a conserved type. Taxon 59: 295–296.

Stubbe D, Wang X-H, Verbeken A. 2012. New combinations in *Lactifluus*. 2. *L.* subg. *Gerardii*. Mycotaxon 119: 483–485. http://dx.doi.org/10.5248/119.483

Verbeken A, Nuytinck J, Buyck B. 2012. New combinations in *Lactifluus*. 1. *L.* subgenera *Edules*, *Lactariopsis*, and *Russulopsis*. Mycotaxon 118: 455-458. http://dx.doi.org/10.5248/118.447